Implementation of Zachman Framework on Hotel Online Reservation System

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ARTICLE INFO	ABSTRACT
	Implementation of Zachman Framework on Online Reservation System at Hotel Claro Makassar is a strategic effort made by the hotel to improve operational efficiency and customer experience. In the competitive environment of the hospitality industry, an integrated online reservation system is an important requirement for modern hotels. This research aims to investigate and analyze the benefits of using Zachman Framework in developing a comprehensive and effective online reservation system at Hotel Claro Makassar. Zachman Framework is used as a structured architecture framework, which helps in designing, implementing, and managing information systems by considering a variety of different perspectives. This research methodology involves the stages of needs analysis, system design, program implementation, and testing using white box and black box methods. The Zachman Framework is used as a guide to identify and understand important elements in an online hotel reservation system, including problem identification, business scope, governance, information model, technology, and system deployment. The result of this research is an online hotel reservation system that can facilitate users in searching, reserving, and canceling rooms online, as well as allowing hotel management to manage reservation data, room availability, and payment transactions efficiently. The implementation of this system is expected to improve the efficiency of hotel operations and provide a better experience for users in making hotel reservations online.

1. INTRODUCTION

Online reservation systems have become an increasingly important necessity in various areas of industry, such as hotels, flights, and public transportation. This system allows users to order services or products online easily and efficiently (Cho et al., 2018). However, the implementation of a successful online reservation system is not as simple as choosing a platform and launching it. Careful planning and modeling is required to ensure that the system can be properly integrated into complex hotel operations. To overcome this challenge, Hotel Claro Makassar chose to implement the Zachman Framework in the development of their online reservation system.

One of the architectural approaches that is widely used in information system design is the Zachman Framework. This framework provides clear and systematic guidance for mapping the data, process, and technology needs required in the design of information systems. The Zachman Framework was first published by John Zachman in 1987 in his paper entitled A Framework for Information System Architecture in the IBM System Journal.

The Zachman Framework is a scheme for classifying enterprise artifacts. ZF consists of 6 columns and 6 rows (Chotimah, S. E., & Handayaningsih, S. 2017)

The Zachman Framework is a structured architectural framework that helps in understanding, planning, and organizing all aspects related to an information system (Nasution et al., 2018). Using this framework, Hotel Claro Makassar can understand different perspectives, including business perspectives, data, processes, technology, and people, which are essential in designing and implementing an effective online reservation system.

By adopting the Zachman Framework, Hotel Claro Makassar can optimize the use of resources and ensure that all elements of the online reservation system are well integrated. In addition, this framework helps in managing the risks and complexities associated with system development, as well as facilitating collaboration between the departments involved, such as marketing, finance, and operations (Ertaul et al., 2011). By combining information technology and the Zachman Framework, Hotel Claro Makassar hopes to improve their operational efficiency, optimize customer experience, and gain a competitive advantage in the increasingly tight hospitality industry. Therefore, research on the implementation of the Zachman Framework on the online reservation system at Hotel Claro Makassar will provide valuable insights for the hospitality industry and provide practical guidance for other hotels looking to adopt this technology.

Additionally, the use of the Zachman Framework facilitates collaboration between the departments involved in the project, such as marketing, finance, and operations departments. In the context of online reservation systems, effective collaboration between these departments is essential to ensure that the system can meet the overall needs of the business, provide accurate and up-to-date information, and provide a satisfying experience for customers (Shafighi and Shirazi, 2017). By combining information technology and the Zachman Framework, Hotel Claro Makassar hopes to improve their operational efficiency, optimize customer experience, and gain a competitive advantage in the increasingly tight hospitality industry. Therefore, research on the implementation of the Zachman Framework on the online reservation system at Hotel Claro Makassar will provide valuable insights for the hospitality industry and provide practical guidance for other hotels looking to adopt this technology.

This research aims to design and develop an online hotel reservation system using the Zachman Framework as the foundation of enterprise architecture. The purpose is to produce a structured and systematic reservation system that enables users to easily search, book, and cancel rooms online, while allowing hotel management to efficiently manage reservations, room availability, and payment transactions. The system is also validated through white box and black box testing to ensure functionality, reliability, and alignment with user needs.

In addition, this study aims to provide guidance for users in utilizing the system and carrying out routine maintenance, thereby ensuring sustainability in its application. Beyond its practical contribution, this research also serves as a reference for other organizations seeking to adopt enterprise-based approaches in system design and development. By applying the Zachman Framework, the study demonstrates that an integrated architectural perspective can improve operational efficiency, enhance customer satisfaction, and support competitiveness in the hospitality industry

2. METHODS
2.1 Frame of Mind

The Zachman Framework provides an overview of the organization's architecture as a whole by breaking down complex corporate systems into more structured elements. The framework includes a global plan and technical details that are laid out in the form of easy-to-understand lists, models, and graphs. By using the Zachman Framework, developers can design a system that is clear, structured, easy to understand, balanced, and comprehensive (Pramana, D., Yuningsih, L., Bali, S. S., No, J. R. P., & Renon, D. B, 2013).
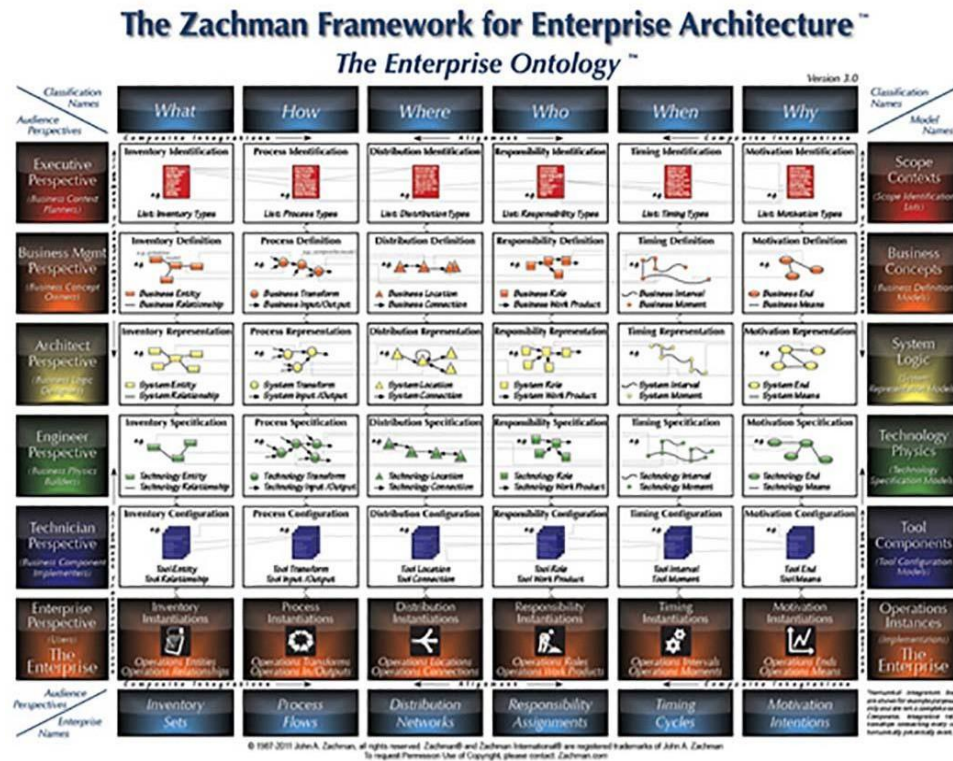
Figure 1. Zachman Framework

Figure 1 shows the structure of the Zachman Framework which consists of six columns (What, How, Where, Who, When, Why) and six lines of perspective (Executive, Business Management, Architect, Engineer, Technician, Enterprise). Columns represent the main focus or dimensions of the system such as data, processes, networks, responsibilities, time, and motivation. Meanwhile, the line describes the perspective of stakeholders ranging from planners, management, system architects, to technicians and operational implementers. With this format, the Zachman Framework serves as a conceptual map that guides organizations in connecting business objectives with the information systems that support them (Lapalme et al., 2016).

Each column in the Zachman Framework has a different focus or represents an abstraction of the product from a particular perspective. This focus is associated with fundamental questions (5W+1H), where the answers given depend on the point of view used. For example, a business perspective answers the "What" question regarding the entity, goals, and business needs, so that developers can understand important aspects such as room inventory management, marketing strategy, and payment processing. The data perspective also highlights the "What", but places more emphasis on system-managed information, such as guest data, room data, and reservation data (Pereira and Sousa, 2004). This approach helps to design efficient databases and map relationships between entities.

In addition, the process perspective answers the "How to" question, which is related to the steps and workflows in the reservation system, such as room search, pricing, and reservation confirmation. The technology perspective answers the "Where", which includes the hardware infrastructure, software, networking, and other components needed. Meanwhile, the perspective of the person answering "Who", which is the role and responsibility of the individual or team involved in the development and use of the system. By paying attention to these various perspectives, stakeholder involvement can be well accommodated in the development process (Nasution et al., 2018).

Taking all perspectives into account, the Zachman Framework helps create holistic planning in the

development of online reservation systems. This approach allows Hotel Claro Makassar to design, implement, and manage a reservation system that is effective, integrated, and tailored to business needs and customer experience. Thus, this framework not only strengthens the technical aspect, but also supports the achievement of competitive advantages in the hospitality industry (Guntur Guntur and Sutedi Sutedi, 2024).

2.2 Analysis Flow

1. Problem Identification

First of all, in the Zachman Framework approach, the first step is to identify the problem at hand. Furthermore, analysis and system design were carried out using this approach. The first step in system analysis and design is to determine the scope of the business that includes all the data, processes, and network configurations needed. Then, a business model design is made that describes system governance using a Use Case Diagram, as well as an information system model in the form of Class Diagram, Activity Diagram, and Sequence Diagram.

After the analysis and design stage, technology design is carried out which includes database design and user interface. Furthermore, in the Detailed Representation stage, the program is created and tested using the white box and black box methods. Finally, at the Functioning Enterprise stage, a guide is made to function the system and manage its operations. By using the Zachman Framework approach, it can be ensured that the system is well-designed and meets specific business needs (Martuti et al., 2020).

2. System Scope

The scope of data includes all information related to the hotel reservation process, such as the user's personal data (name, address, contact), payment data, room information (availability, facilities, prices), and reservation historical data. Due to the highly sensitive nature of this data, Hotel Claro Makassar needs to ensure security and privacy through the implementation of encryption, strict access policies, and compliance with regulations such as the General Data Protection Regulation (GDPR) or local privacy rules. In the context of the Zachman Framework, data management is included in the What dimension, so data architecture design must pay attention to aspects of security, integrity, and efficiency of information management (Ertaul et al., 2011). Hotel Claro Makassar needs to design an adequate data architecture to store and manage reservation data efficiently and securely. The use of proper encryption methods, strict access policy settings, and constant data security monitoring are important steps in protecting the integrity and confidentiality of data in the online hotel reservation system.

The scope of the process includes all the stages that users go through when making online reservations, starting from room search, date selection, filling out forms, verifying data, payment, to receiving reservation confirmation. This process should be designed to be efficient, easy to understand, and reliable to provide an optimal reservation experience. In the Zachman Framework, this aspect is in the How dimension, which emphasizes the importance of modeling workflows and activities so that the system can run effectively according to business needs (Pereira and Sousa, 2004).

The scope of computer network configuration includes the infrastructure that supports the online reservation system, such as servers, databases, firewalls, network devices (routers, switches, access points), and internet connectivity. Servers need to be configured to have optimal performance and high scalability, while databases need to be designed with an efficient and secure structure. Firewalls are used to protect systems from external threats by restricting unauthorized access, while network devices ensure the smooth flow of data. In addition, network devices such as routers, switches, and access points must also be properly configured to ensure stable and reliable connectivity. The right configuration will ensure efficient data transmission between the various system components, as well as support optimal availability and performance. Finally, internet

connectivity is an important aspect in computer network configuration. The internet connection must be stable and fast to allow users to make hotel reservations online without a hitch. In addition, the security of the internet connection must also be taken into account by using strong encryption protocols and setting proper access policies. In the Zachman Framework, this is represented by the Where's dimension, which focuses on the design of technological infrastructure as the foundation of system availability, security, and scalability (Iyamu, 2018).

By paying attention to the integrated aspects of data, processes, and network configuration, the Zachman Framework provides systematic guidance in designing an online reservation system. This approach helps Hotel Claro Makassar ensure a safe, efficient, and adaptable system to future business and technological developments (Nogueira et al., 2013).

3. Business Model

This Business Model in the form of a Use Case Diagram provides a high-level overview of the functionality of the system and the interactions that occur between users and hotels. This diagram can be used as a starting guide in designing an online hotel reservation system to ensure that the essential functions are covered and can provide benefits to both users and hotels.

Through the Use Case Diagram, it is possible to identify the main use cases involving various actors, such as users (e.g., hotel guests) and systems (e.g., reservation management). These use cases represent the tasks or activities that must be performed by the system or actors involved. This diagram helps in identifying and understanding the business needs and user needs in the online reservation system at Hotel Claro Makassar. For example, the use cases seen in the chart can include searching for room availability, making reservations, managing reservations, payments, and accessing hotel information.

By paying attention to the Use Case Diagram, developers can prioritize and design the essential features in the system, as well as ensure that the interaction between users and hotels occurs well. This diagram also helps in better communication and understanding between developers, users, and other related parties in the process of developing and implementing an online reservation system. The Use Case Diagram is a useful tool in designing an online hotel reservation system at Hotel Claro Makassar, helping to ensure that important functions and interactions between users and hotels are well covered in the developed system.

4. Information Systems Model

The information system model in online hotel reservations includes various components that interact with each other to support the reservation process. These components include a user interface that allows users to search, select rooms, and make reservations; a database to store room availability information, reservation details, and user data; business logic for processing reservation requests, managing data, and sending confirmations; as well as integration with payment systems to facilitate online payment transactions (Ivanov, 2008). This model ensures a structured and accurate flow of information in running the online hotel reservation process.

Integration with payment systems is also an important part of this model. The online hotel reservation system must be connected to a secure and trustworthy payment system, so that users can make online payment transactions easily and conveniently. This integration allows users to enter their payment information, such as credit card numbers or other payment methods, and ensures that payments are made securely and verified. With this information system model, Hotel Claro Makassar can ensure that the online hotel reservation process runs well and provides a satisfactory experience for users. This model allows for a structured and accurate flow of information, minimizes user error and confusion, and improves efficiency and speed in the reservation process.

5. Technology Model

a. Database

In the Zachman Framework Technology Model, the design of the database is an important step in the development of an online hotel reservation system at Hotel Claro Makassar. The database will

act as a central storage to store and manage all the data required in the system's operations, such as room information, reservations, users, and payment transactions. A good database design will ensure efficient structure, data consistency, and the ability to perform data search and manipulation operations quickly and accurately (Lv, 2021).

The database design process involves modeling the entities and relationships between entities in the database. First, a needs analysis is required to identify the business entities associated with the online reservation system, such as rooms, guests, reservations, and ancillary services. After that, the relationship between these entities must be determined, such as the relationship between the reservation and the guest or the relationship between the room and additional amenities. Furthermore, database design involves determining attributes for each entity, i.e. information that needs to be stored for each entity, such as room numbers, guest names, check-in dates, and payment methods. In addition, it is also necessary to consider the primary key and the foreign key to ensure data integrity and referential consistency between tables.

During database design, it's also important to consider performance considerations, such as selecting the appropriate data type, efficient indexing, and query optimization to ensure fast data access and manipulation. A good database design should also consider data security. Security measures, such as encryption of sensitive data, proper access settings, and data protection policies, should be implemented in the database structure.

In the context of the implementation of the Zachman Framework on the online reservation system at Hotel Claro Makassar, a good database design will ensure that the system can manage data efficiently, generate accurate reports, and provide a satisfying experience for customers. With a solid database design, Hotel Claro Makassar can improve operational efficiency, minimize the risk of data loss, and ensure data consistency and integrity in their online reservation system (Al Fajri, 2020).

b. User Interface (UI)

In addition, the user interface is also an important aspect of the Technology Model. The user interface will be the point of interaction between the user and the system. Good user interface design must consider the needs and preferences of the user, and ensure an intuitive, easy-to-understand, and easy-to-use interface (Sriphaew and Katkaeo, 2017). This will improve the user experience in making online hotel reservations, facilitate navigation, and optimize the efficiency of using the system.

When designing a user interface, it is necessary to consider the needs and preferences of the user. Conducting user research, such as interviews or gathering feedback, will help understand the needs and expectations of users in using an online reservation system. This information can be used to design an intuitive, easy-to-understand, and easy-to-use display. Good user interface design also pays attention to aesthetic aspects and visual harmony. The selection of appropriate colors, a well-organized layout, and representative icons or images can help users feel comfortable and connected to the system. The placement of essential elements, such as reservation forms, room availability schedules, and pricing information, should be easy to find and accessible to users.

Good navigation is also a key factor in user interface design. Providing well-structured menus, clear icons, and easy-to-follow links will make it easier for users to switch between different pages or features. A good understanding of the workflow and user needs in making reservations will help design efficient and intuitive navigation. Responsive design is also an important aspect of the user interface. In an era of increasingly dominant mobile device use, ensuring that the user interface can adapt well to various devices, including smartphones and tablets, is a key factor to improve user accessibility and convenience.

By paying attention to all these aspects in the design of the user interface, Hotel Claro Makassar can improve the user experience in making online hotel reservations. A good user interface will make it easier for users to navigate the system, enter the necessary information, and complete the reservation process quickly and efficiently. This will help create a satisfying experience for users and

increase customer satisfaction at Hotel Claro Makassar.

6. Representation Details

The Detailed Representation stage will involve designing detailed databases to be used. The database design will consider the data structure required to store information about room availability, reservation details, user data, and payment transactions. Database design must ensure data integrity, consistency, and optimal performance in managing data. In the white box testing method, each code block and execution path is tested separately to ensure the correctness of the internal implementation. In the example above, we perform tests for various operations such as room addition, availability check, reservation, reservation cancellation, and room removal.

Meanwhile, in the black box testing method, testing is carried out by focusing on the input and output of the program without paying attention to its internal implementation. We test the functions with several predefined test cases, such as checking room availability, reservations, reservation cancellations, and room deletions. After running the test using both methods, if no error message appears, then the program is considered to have successfully passed the white box and black box tests.

7. Functioning Enterprise

The Functioning Enterprise stage in the context of an online hotel reservation system refers to the operation and management of the system that has been implemented. At this stage, the online hotel reservation system has been functioning and actively used by users and related parties. The Functioning Enterprise stage in the online hotel reservation system marks the active running of the system in daily operations. The system will continue to accept reservations, process requests, store and manage data, and maintain the availability and accuracy of information to support effective hotel operations and provide satisfactory service to users.

During the Functioning Enterprise phase, the online hotel reservation system will play a role in supporting effective hotel operations. The information managed by the system will be used to manage room allocation, maintain proper room availability, and optimize hotel revenue through a dynamic rate strategy. The system will also facilitate a smooth check-in and check-out process, payment processing, and management of user data, such as reservation history and customer preferences. In addition, the online hotel reservation system must also maintain a high level of security and data integrity. Security measures, such as the use of sensitive data encryption and appropriate access settings, should be implemented to protect user information and payment transactions from possible threats.

Overall, the Functioning Enterprise stage is the stage where the online hotel reservation system becomes the operational backbone of Hotel Claro Makassar. This system provides essential support in managing reservations, optimizing the use of hotel resources, and providing satisfactory service to users. With a well-functioning system, Hotel Claro Makassar can improve operational efficiency, improve customer experience, and strengthen their position in the hospitality industry.

3. RESULTS AND DISCUSSION
3.1 Data Requirement Analysis

Data is the main ingredient of information systems management work. Data is a fact that occurs because of organizational activities that occur in the transaction line, lower line management, midfield, and upper line. The results of the analysis of data needs in the hotel reservation system obtained using the Zachman Framework approach are as follows:

Table 1. Data Requirement Analysis

Yes	Data Name	Description
1	User	Data from guests who made reservations.
2	Room	Room data owned or managed by the hotel.
3	Room type	Room type data managed by the hotel.
4	Bank	Bank data used in advance payments.
5	Deposit payment	Down payment transaction data.
6	Reservation	Reservation transaction data (booking).
7	Reservation details	Detailed data of reservations made by guests.
8	Check in	Check in transaction data.
9	Check in details	Check in transaction details data
10	Check out	Checkout transaction data.

3.2 Process Requirement Analysis

The results of the analysis of process requirements in the hotel reservation system obtained using the Zachman Framework approach can be seen in the following table:

Table 2. Process Requirement Analysis

Yes	Process Name	Description
1	Room Search	The search process is carried out by guests to search for available rooms.
2	Reservation	The room booking process is according to the type of room and the desired time.
3	Guest Registration	The process of registering the data of the guest who will make the reservation.
4	Login	The process of authenticating user access rights.
5	Manage Data	The process for processing *master* data to be used in the system.
6	Reservation Identification	The process of checking the status of the reservation before the *check-in* process.
7	Guest *Check-in*	The process of storing *checkin transaction data*.
8	Checkin Identification	The check-in status check process before the *checkout process*.
9	Guest *Checkout*	The process of storing *checkout transaction data*.

3.3 Computer Network Configuration

A computer network is a group of autonomous computers that are interconnected with each other using communication protocols through transmission media, so that they can share with each other using existing resources and communicate (Chotimah, S. E., & Handayaningsih, S. 2017). The reservation system that will be built is web-based that can be accessed from anywhere through the internet network. The computer network configuration of this system is as follows:
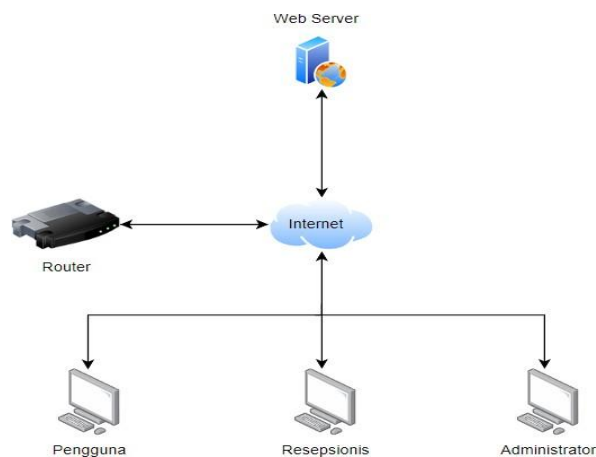

Figure 2. Computer Network Configuration

3.4 Business Model Design

UML (Unified Modeling Language) is a graphic/image-based language for visualizing, specifying, building, and documenting an OO (Object-Oriented) based software development system. UML itself also provides a standard for writing a blue print system, which includes the concept of business processes, writing classes in a specific programming language, database schemas, and the components needed in a software system (Imelda).

a. Use Case Diagram

In this use case diagram, there are 3 (three) actors, namely Receptionist, Guest, and Administrator. Here is a use case diagram of a hotel reservation system using the Zachman Framework approach:
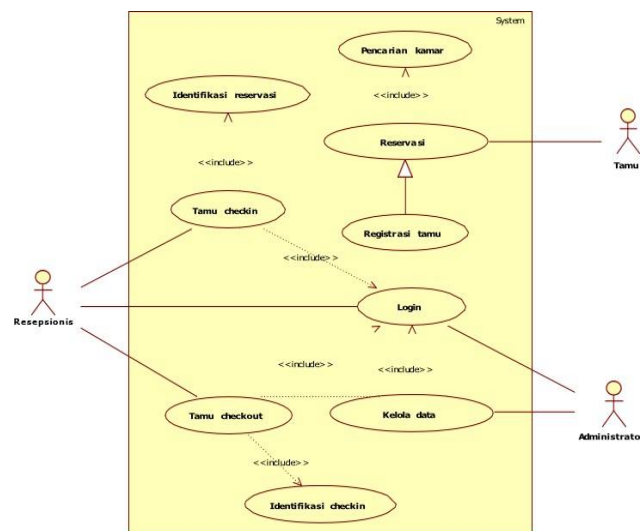
Figure 3. Use Case Diagram

b. *Class Diagram*
        Class Diagrams describe the objects used in the hotel reservation information system. The objects can be seen in the following figure:
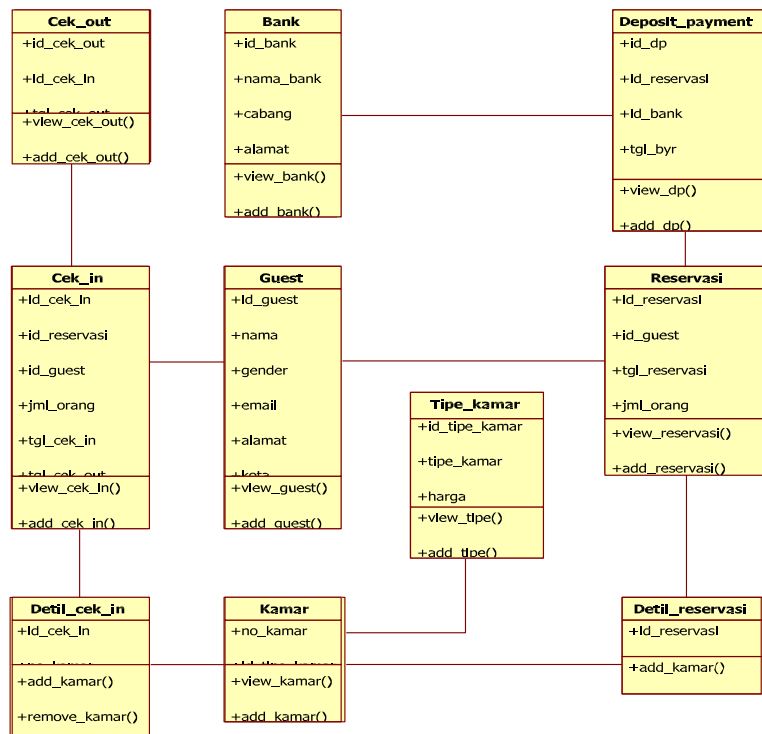
Figure 3. Diagram Class

c. **Reservation Activity Diagram**
        In this process, guests will complete the reservation data. Before being saved, the input value will be validated first to avoid possible data storage errors on the
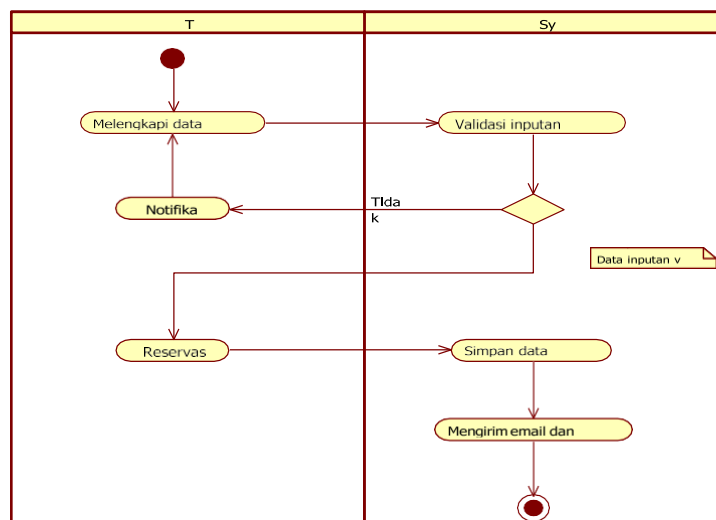Database. Here is an image of the activity diagram:

Figure 5. Reservation Diagram

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d.   Sequence Diagram Reservasi

This sequence diagram illustrates the sequence of processes that occur when guests are about to perform Hotel reservations. The stages for the reservation process depicted in the sequence diagram are as follows:

1. Guests looking for a room
2. The system will check the availability of the room.
3. Available rooms will be displayed.
4. Guests will input reservation data.
5. The input will be validated.
6. If the input is valid, the reservation will be continued.
7. The last stage is for the system to display reservation notifications
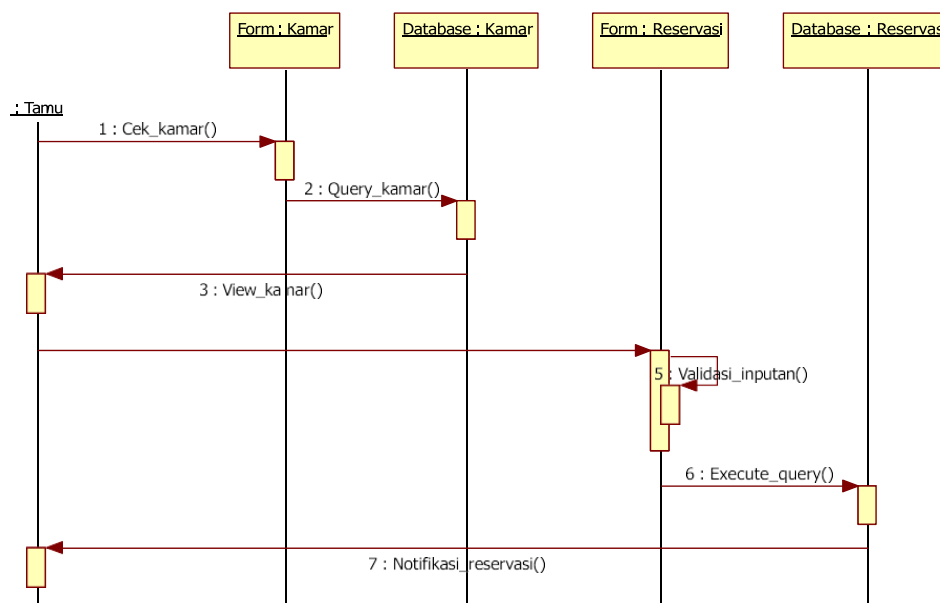
Figure 6. Reservation Diagram

3.5   Database Design

The database design is shown in the form of an Entity Relationship Diagram (ERD). ERD is a graphical notation in conceptual data modeling that describes the relationships between storages. Here is a picture of the ERD results from this study:
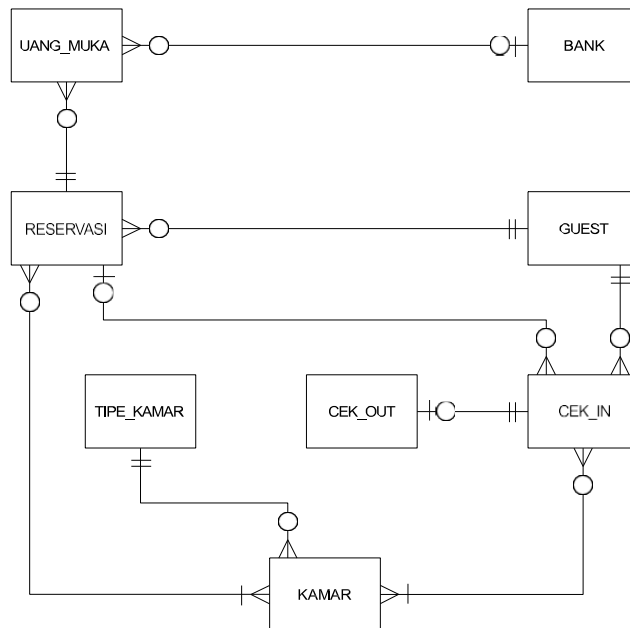
Figure 7. Database Design

3.6   System Implementation and Testing
a.   Home Page

This page is the first page that will appear when this website is accessed. At the top of the page bar, there's a navigation menu that you can use to switch to another page you're looking for. Here is what the home page image looks like.
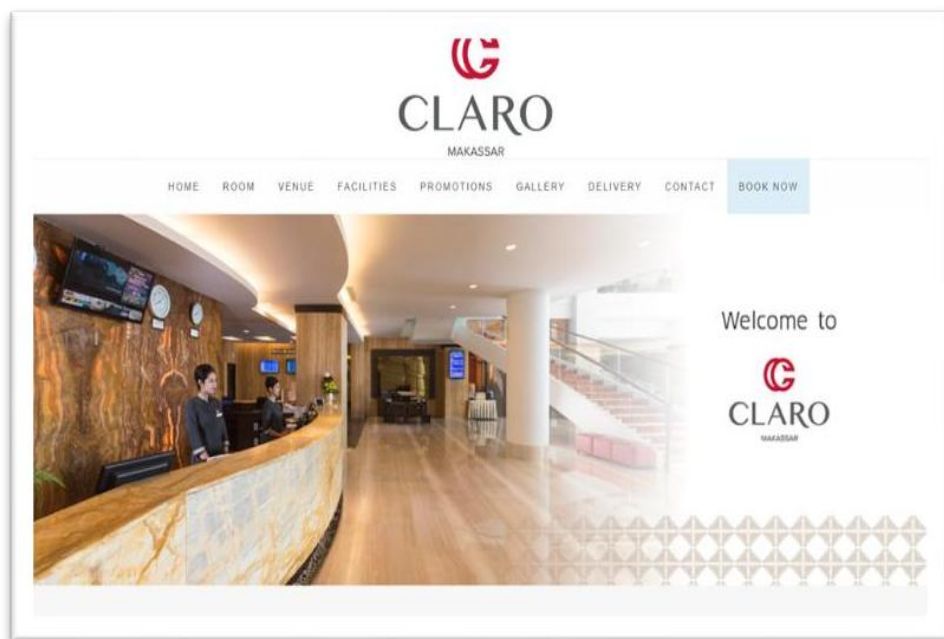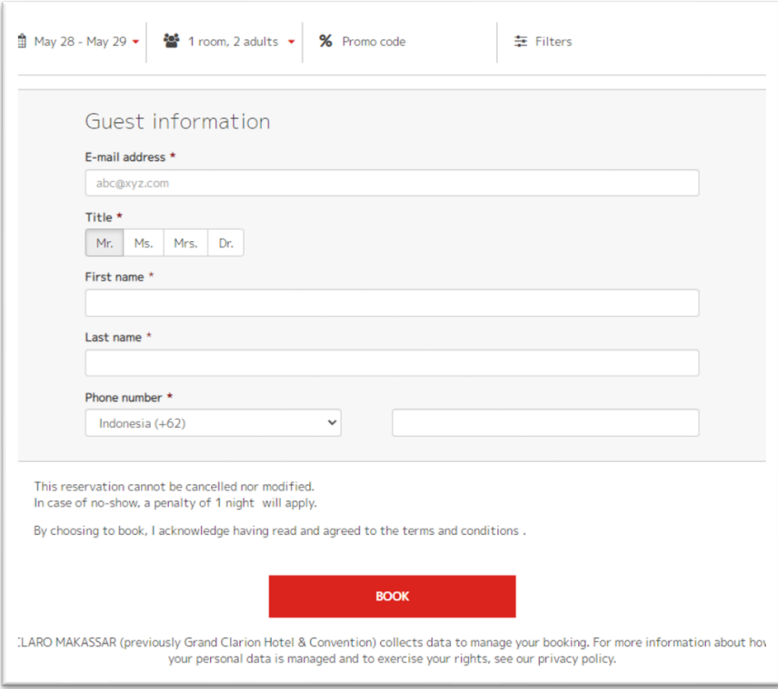

Figure 8. Home Page View

b. Guest Data Registration Page

On this page there is a form that must be completed by guests who want to make a reservation. Here's what the guest registration page image looks like:

Figure 9. Guest Data Registration Page View

c. Reservation Data Page

This page is used to confirm reservation data, both rooms and reservation dates

Figure 10. Reservation Data Page View

d. White box Testing

White box testing is a testing method by looking into modules to examine existing program codes, and analyze whether there are errors or not (Gupta, 2014). The whitebox test in this study is by conducting a test case in the reservation process. Where tests are carried out on the storage module and validation of reservation data. From the tests, it can be concluded that every module, function, branching, and looping has run well.

In this white box test, the main focus is on the reservation data storage and validation module. A test case or test scenario that has been designed will be run to check whether each module, function, branching, and looping in the reservation module runs well according to the specifications that have been set. Through this white box test, system developers will analyze existing program codes to find and fix errors or bugs that may occur. By conducting detailed testing at the code level, developers can ensure that every part of the reservation module is working correctly and as expected. The results of this white box test will provide a clearer picture of the integrity and quality of the reservation modules in the system. If the test shows that each module, function, branching, and looping runs smoothly without errors, then it can be concluded that the reservation module has been successfully implemented and meets the requirements that have been set.

With the white box testing carried out, Hotel Claro Makassar can have greater confidence in the quality and reliability of the reservation module in their online hotel reservation system. Knowing that the reservation module has gone through comprehensive testing and successfully passed all the test cases, hotels can run their systems with confidence and provide better service to users.

CRM planning is carried out on a computer which aims to help improve services and identify (Sumitro et al., 2023). Creating the BCA website includes designing the CRM website home page which consists of a home page, company profile, customer information, FAQs and news, as shown in Figure 6. When a user enters the CRM website, the last page displays one. information, information whether launched by BCA products or programs or information about events held by BCA for the public.

e. Black box Testing

Black box testing focuses on whether the program unit meets the requirements mentioned in the specifications. This test is done to ensure that an event or module will run the right process and produce outputs according to the design. In this study, black box testing was carried out by testing the interface and results of inputs and outputs in the reservation process. The result is that the interface design, both for input and output, is appropriate and valid.

In black box testing, special attention is paid to the interface and the results of the inputs and outputs in the reservation process. A test case or test scenario that has been prepared will be run to test how the reservation module responds to the given input and produces the expected output. This test is done without paying attention to the internal structure or logic of the program used in the module. By conducting black box testing, it can be evaluated whether the interface design that has been created, both for input and output in the reservation process, is in accordance with the needs of users and the specifications that have been set. This test will verify whether the reservation module can process the given inputs correctly, generate valid outputs, and interact with other system components as expected. The results of this black box test will provide an idea of the extent to which the reservation module can meet the established functionality requirements. If the test shows that the interface and the input and output results in the reservation process are appropriate and valid, then it can be concluded that the reservation module has successfully met the requirements that have been set.

Through careful black box testing, Hotel Claro Makassar can ensure that the reservation

module in their online hotel reservation system works properly and provides a satisfying experience for users. By testing the functionality of the system without paying attention to the details of implementation, hotels can have greater confidence in the quality and performance of their reservation modules.

4. CONCLUSION

The results of this study demonstrate that the online hotel reservation system designed with the Zachman Framework successfully facilitates users in searching, booking, and canceling rooms online, while also enabling hotel management to manage reservations, room availability, and payment transactions more efficiently. By integrating perspectives of business, data, process, technology, and people, the Zachman Framework ensures that the system is comprehensive, reliable, and aligned with organizational needs. Furthermore, the testing results indicate that the system operates effectively and meets the intended functional requirements.

This implementation provides Hotel Claro Makassar with improved operational efficiency, enhanced customer experience, and a competitive advantage in the hospitality industry. In addition, the findings of this study contribute as a reference for other hotels or similar service providers aiming to adopt enterprise-based system design. The integration of enterprise architecture frameworks such as Zachman not only supports organizational performance but also ensures adaptability to future technological advancements, thereby offering long-term strategic value.

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